

Section 8

Whiterocks Hatchery Enhancement Plan

8.1 Facility Overview

Site Development History

The first parcel of land for the hatchery was purchased by the State of Utah in 1923, with another purchase following in 1946. The hatchery building and one of the residences were built in the early 1940's. The office/garage and a second residence were built in the early 1960's (Figure 8-1).

Water Supply Quantity and Quality

Water supply for the station is collected from a group of springs located north of the facility (Figure 8-2). The quantity of flow varies throughout the year with an average low flow of 2,468 gpm occurring in May and an average high flow of 3,725 occurring in August. Temperature varies from a low of 47°F in January to a high of 51°F during July through September. Dissolved oxygen levels vary from 8.3 to 10.3 mg/l, compared to the saturation value of 9.3 mg/l. The pH of the water is moderate at 7.0 to 7.4 (Table 8-1).

Currently none of the water at this site is treated in any manner prior to use. The system of collection consists of a combination of subsurface infiltration collection pipes and surface impoundment.

Table 8-1. Water quality measurements for Whiterocks Hatchery.

Location	Date	Recorded By	Dissolved Oxygen (mg/l)	Total Dissolved Gases (% Saturation)	Dissolved Oxygen (% Saturation)	Dissolved Nitrogen (% Saturation)	pH
Spring box	7/30/96	FishPro	7.7	105.4	—	111	—
Right spring	7/30/96	FishPro	8.3	104.2	—	106	—
Left spring	7/30/96	FishPro	8.1	102.3	—	104	—
Unknown	Unknown	Utah DWR	9.9	—	—	—	7.5

Location	Date	Recorded By	Hardness (mg/l)	Alkalinity (mg/l)	BOD (mg/l)	TDS (mg/l)	TSS (mg/l)
Unknown	Unknown	Utah DWR	290	240	—	—	—

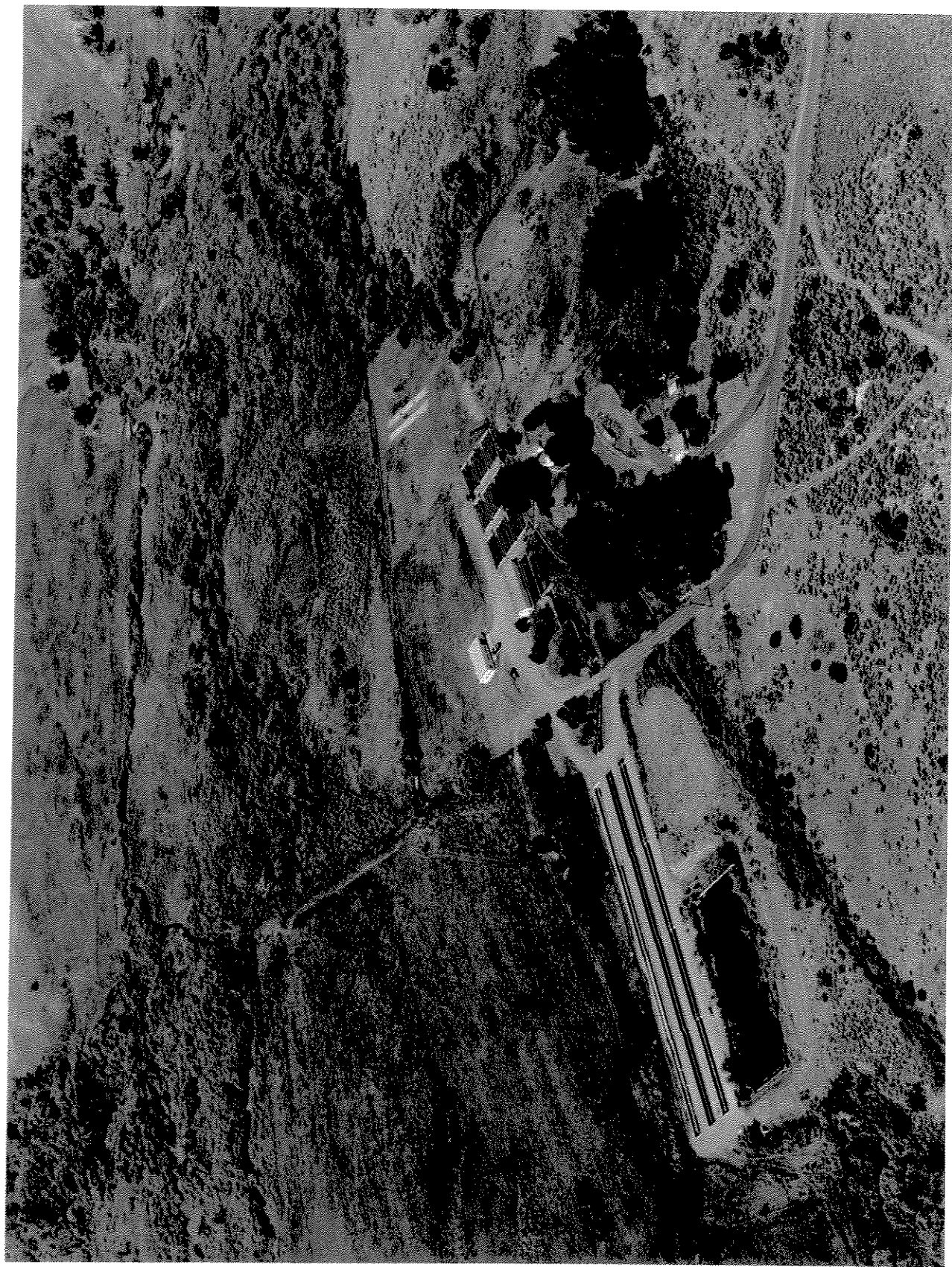


Figure 8-1. Aerial photo of Whiterocks Hatchery.

UFS024.DGN

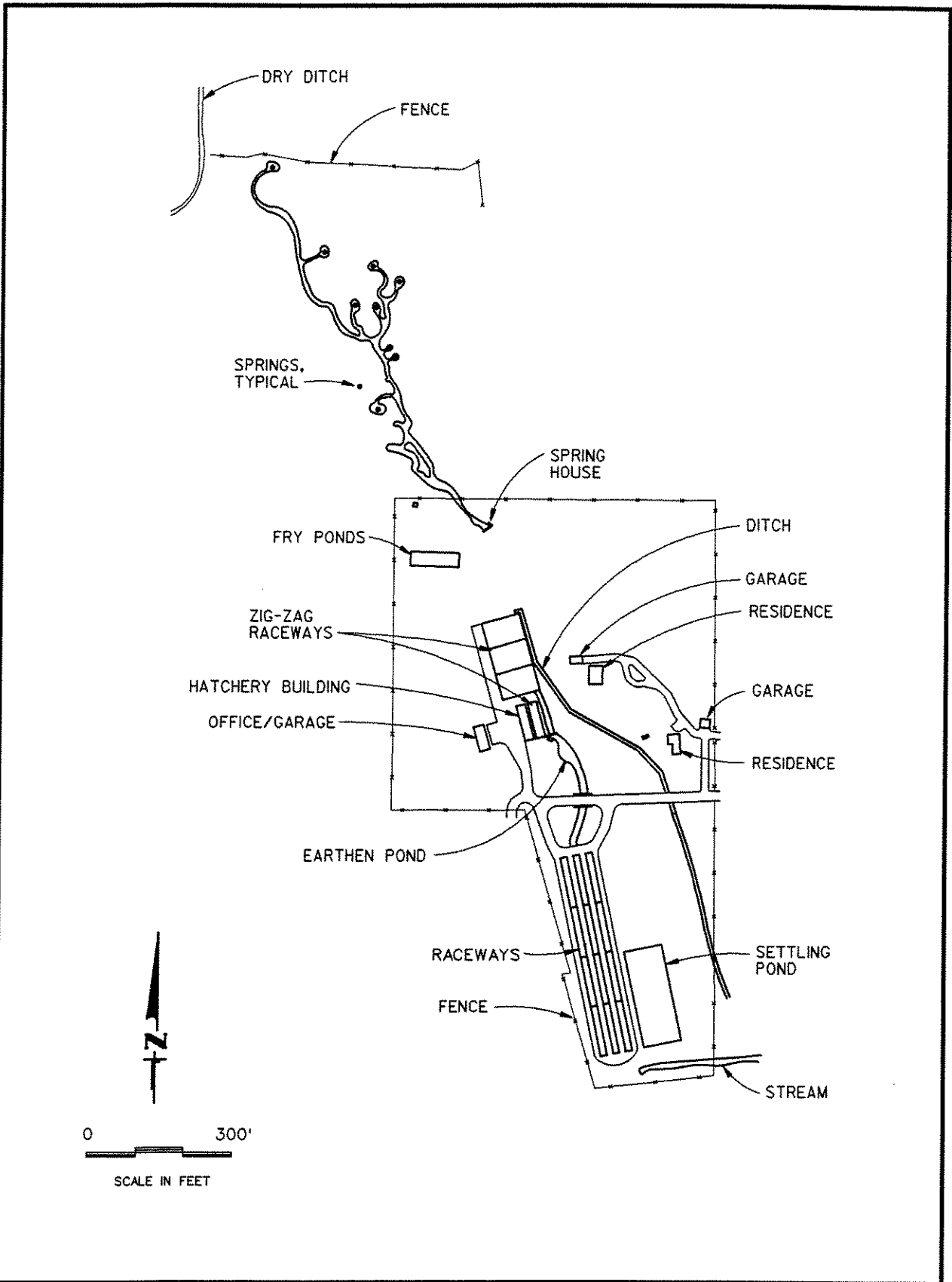


Figure 8-2. Existing Whiterocks Hatchery Plan

Fish Rearing Facilities

Existing rearing facilities at Whiterocks Hatchery include a hatchery building equipped with hatching jars and fiberglass fry tanks. Outdoor rearing units include concrete zig-zag raceways, conventional concrete raceways, and an earthen pond (Table 8-2). A group of concrete fry ponds at the north end of the facility is not used.

Table 8-2. Existing production units at Whiterocks Hatchery.

Unit Type	Quantity	Unit Dimensions (ft)	Unit Volume (cf)	Total Volume (cf)	Comments
<i>First Pass (Fresh Flow) Units</i>					
Fry ponds	4	3 x 100 x 1.7	500		Not used
Zig-zag Raceway	3	3 x 200 x 2.0	1,200	3,600	
Zig-zag Raceway	4	3 x 280 x 2.0	1,680	6,720	
Zig-zag Raceway	2	3 x 240 x 2.0	1,440	2,880	
Zig-zag Raceway	1	3 x 350 x 1.3	1,361		Not used
<i>Second Pass (Reuse Flow) Units</i>					
Earthen pond	1	12 x 110 x 1.5	1,980	1,980	
Raceways	6	6 x 400 x 1.8	4,400	26,400	(4) 100' sections
<i>Site Total</i>				41,580	

Support Facilities

The hatchery office is attached to a three bay garage/shop. Sack feed is stored in a room attached to the hatchery building.

8.2 Fish Production Capacity

1993-1995 Average Production

The average total production at Whiterocks Hatchery from 1993 to 1995 was 35,511 pounds. By weight, rainbow trout comprise the largest portion of production, however larger numbers of kokanee and cutthroat are produced and planted at smaller sizes. Lesser quantities of brooks and

browns are also reared (Table 8-3). Due to colder water temperature (48°F), production emphasis is placed on large numbers of smaller fish.

Table 8-3. Fish production at Whiterocks Hatchery 1993 to 1995.

Year	Brook	Brown	Cutthroat	Kokanee	Rainbow	Total
<i>By Number</i>						
1993	51,193	169,933	542,179	342,147	263,991	1,369,443
1994	13,470	28,971	500,281	406,830	132,404	1,081,956
1995	155,416	120,642	392,900	277,252	347,406	1,293,616
Average	73,360	106,515	478,453	342,076	247,934	1,248,338
<i>By Weight (pounds)</i>						
1993	614	1,883	3,395	2,308	30,670	38,870
1994	104	333	2,795	1,510	26,513	31,255
1995	1,942	1,658	2,290	1,210	29,307	36,407
Average	887	1,291	2,827	1,676	28,830	35,511
Average Size (fish per pound)	83	82	169	204	9	35

Production Capacity

DWR personnel have determined that loading conditions in the month of April dictate the maximum production capacity of the station. Flow index calculations using 5.0 mg/l as a minimum dissolved oxygen limit indicate that the flow available in April is sufficient to support the current production levels, but cannot support any production increase without oxygen supplementation. The existing rearing volume is sufficient to hold approximately four times the current production based on density index calculations. Calculation of the accumulation of unionized ammonia indicates more than 27 times the current production levels would be required to exceed the ammonia limitation (Table 8-4).

Table 8-4. Existing capacity of Whiterocks Hatchery.

Limiting month:	April	Target Flow Index (FI) (lb/gpm/in):	1.58
Average flow (gpm):	2,459	Target Density Index (DI) (lb/cf/in):	0.40
Average water temperature (°F):	48	Estimated N loading (lb N/lb food):	0.032
Elevation:	6,080	Percentage N as unionized NH ₃ :	0.17%
pH:	7.0	Max. allowed unionized NH ₃ (mg/l):	0.0125

Species	Fish Length (in)	Total Weight (lb)	Feed Rate (lb/day)	Nitrogen Loading (lb/day)	Req. Flow as per FI (gpm)	Req. Volume as per DI (cf)
Rainbow	2.0	207	6.4	0.21	66	259
Rainbow	2.7	395	9.5	0.30	93	366
Rainbow	6.0	2,798	28.5	0.91	295	1,166
Rainbow	7.5	12,075	102.3	3.27	1,019	4,025
Brown	1.8	611	20.5	0.66	215	849
Brown	8.3	2,268	17.6	0.56	173	683
Brook	1.2	148	8.3	0.27	78	308
Kokanee	2.2	1,794	52.4	1.68	516	2,039
Totals:		20,296	245.5	7.86	2,454	9,694

Total annual production (lb):	35,511	0.0134 = unionized NH ₃ loading (lb/day)
Current month as % of annual:	57%	0.0005 = unionized NH ₃ concentration (mg/l)

	Ammonia	Flow	Volume
Existing condition or requirement:	0.0005	2,454	9,694
Parameter standard or available quantity:	0.0125	2,459	41,580
Existing production as percentage of capacity:	4%	100%	23%
Potential production as percentage of existing program:	2763%	100%	429%

- Whiterocks is producing at its maximum capacity with regards to flow during its heaviest loaded month.

Production Capacity with Proposed Improvements

Table 8-5 illustrates the expanded production capacity proposed for Whiterocks. Oxygen supplementation to 130 percent supersaturation would allow a production increase to 370 percent of existing, for a total annual production of 131,391 lb. Oxygen injection will occur in three places, resulting in a three-pass system.

The rearing space required for this level of production currently exists on site in the 6' x 400' raceways. However, the west pair of raceways is deteriorated beyond repair. These units could be reconstructed in the same location, but velocity conditions would not meet desired criteria. As an alternative, two pairs of 200 ft units are recommended to be installed upstream of the existing raceways, creating the first-pass use of the total water supply. The existing raceways would be

reconfigured into second- and third- pass units by adding LHOs at the head end and at the 200 ft midpoint. This rearing unit configuration is summarized in Table 8-6. Using the assumed April flow of 2,459 gpm and the proposed raceway configuration, raceway velocities would be approximately 91 percent of the minimum velocity criterion (Table 8-7).

Table 8-5. Capacity of Whiterocks Hatchery with proposed enhancements.

- Construct new covered raceways to replace the dilapidated zig-zag raceways.
- Arrange new raceways as a first pass system able to gravity flow to the lower raceways.
- Provide oxygen supplementation with minimum DO at 90mm Hg and maximum at 130% saturation.
- Create an effective three pass system by locating LHOs at the head end of the new raceways, and at the 0' and 200' point of the existing raceways.
- Construct a new hatchery building able to accommodate the incubation and early rearing needs of the program.
- Provide for production at 370% of current program, to the practical limits of oxygen supersaturation.

	April	Annual				
Existing program (lb):	20,296	35,511	(April holding = 57% of annual production)			
Enhanced program (lb)	75,095	131,391				
Enhanced / existing:	370%	370%				
Limiting month:	April	DO @ 100% saturation (mg/l):	9.3			
Average flow (gpm):	2,459	DO minimum under Flow Index (mg/l):	5.0			
Target Flow Index (lb/gpm/in):	1.58	Avail. DO per Flow Index (mg/l):	4.3			
Target Density Index (lb/cf/in):	0.40	DO @ 130% saturation (mg/l):	12.1			
Est. N loading (lb N/lb food):	0.032	DO @ 90mm Hg (mg/l):	6.6			
Percent N as unionized NH3:	0.17%	Avail. DO w/ supplementation (mg/l):	5.5			
Max. unionized NH3 (mg/l):	0.0125	Reduced flow requirement w/ O2 supp.:	78%			
Species	Fish Length (in)	Total Weight (lb)	Feed Rate (lb/day)	Required Flow (gpm) to Meet Criteria		Req. Volume as per DI (cf)
				Ammonia	O2 Supp.	
<i>First Pass</i>						
Brown	1.8	2,261	76	27	623	3,140
Brook	1.2	548	31	11	226	1,141
Kokanee	2.2	6,638	194	70	1,496	7,543
Subtotal:		9,446	300	109	2,345	11,824
Assumed Use:			Flow (gpm):	2,459	Volume (cf):	12,000 (8 sections)
<i>Second Pass</i>						
Rainbow	2.0	766	24	9	190	957
Rainbow	2.7	1,462	35	25	268	1,353
Rainbow	6.0	10,353	105	77	855	4,314
Rainbow	7.5	8,489	72	52	561	2,830
Brown	8.3	8,392	65	47	501	2,528
Subtotal:		29,460	301	209	2,376	11,981
Assumed Use:			Flow (gpm):	2,459	Volume (cf):	12,000 (8 sections)
<i>Third Pass</i>						
Rainbow	7.5	36,189	307	329	2,392	12,063
Assumed Use:			Flow (gpm):	2,459	Volume (cf):	12,000 (8 sections)
<i>Site Total</i>		75,095	908	35,868		

Table 8-6. Proposed production units at Whiterocks Hatchery.

Unit Type	Quantity	Unit Dimensions (ft)	Unit Volume (cf)	Total Volume (cf)	Comments
<i>First Pass (Fresh Flow) Units</i>					
New Raceways	4	6 x 200 x 2.5	3,000	12,000	(2) 100' sections PCAs
<i>Second Pass (Reuse Flow) Units</i>					
Raceways	4	6 x 200 x 2.5	3,000	12,000	(2) 100' sections LHOs
<i>Third Pass (Reuse Flow) Units</i>					
Raceways	4	6 x 200 x 2.5	3,000	12,000	(2) 100' sections LHOs
<i>Site Total</i>				36,000	

Table 8-7. Flows necessary to meet velocity criteria for Whiterocks Hatchery.

Unit Type	Quantity	Cross Section Dimensions (ft)	Min. Unit Flow to Meet 0.1 fps (gpm)	Available Flow (gpm)	
				per Unit	Total
Limiting month:	April				
Average flow (gpm):	2,459				
<i>First Pass (Fresh Flow) Units</i>					
New Raceways	4	6 x 2.5	674	615	2,459
<i>Second Pass (Reuse Flow) Units</i>					
Raceways	4	6 x 2.5	674	615	2,459
<i>Third Pass (Reuse Flow) Units</i>					
Raceways	4	6 x 2.5	674	615	2,459

8.3 Recommended Improvements

Water Supply System

Although the existing water supply system utilizes a system of collection pipes buried in infiltration trenches, it does not flow freely enough to prevent water from flowing at the surface. Part of the problem may be due to roots blocking the pipes. In the process of replacing the collection system, all large vegetation would be removed with the intent of maintaining the area over the springs by mowing. Head boxes for the raceway and hatchery building supplies would be installed far

enough upstream on the springs to provide sufficient head for operation of the dual purpose packed column aerators.

Disease Prevention Measures

Several measures are proposed to deal directly with the threat of disease contamination. In general, exposure to airborne carriers would be mitigated by eliminating surface exposure of the water supply, installing covers over outdoor rearing units, and a floating cover on the settling pond (Figure 8-3). A fish barrier at the settling pond outfall is also proposed.

To prevent disease from being carried in by vehicles, visitor access would be restricted to the designated area, and a truck disinfection station added. All areas work areas would be paved.

Water Treatment

With the amount of fall made available by relocating the hatchery building, a dual purpose packed column aerator system may be used to remove nitrogen gas from the water supply and supplement oxygen. Similarly, the first pass of raceways would also make use of this type of system. The dual purpose columns would allow supplementation by atmospheric oxygen when demand is low. They would be switched to sealed operation with oxygen injection when oxygen demand increases enough to require supersaturation.

The second and third passes of raceways would be equipped with LHO units due to the limited amount of fall available between passes.

An alarm system with oxygen probes in each of the raceways would constantly monitor dissolved oxygen levels and provide warning should a system failure occur.

Waste Treatment

Separate cleaning waste drainlines are proposed along and between the raceways. Risers at intervals would allow connection of the discharge side of a cleaning vacuum system. The entire cleaning waste drain system would be piped directly to the settling pond. Sunshine valves located at the tail end of each 100 ft section of raceways would be connected to the cleaning waste drainlines, allowing flow from any section to be directed away from reuse.

UFS025.DGN

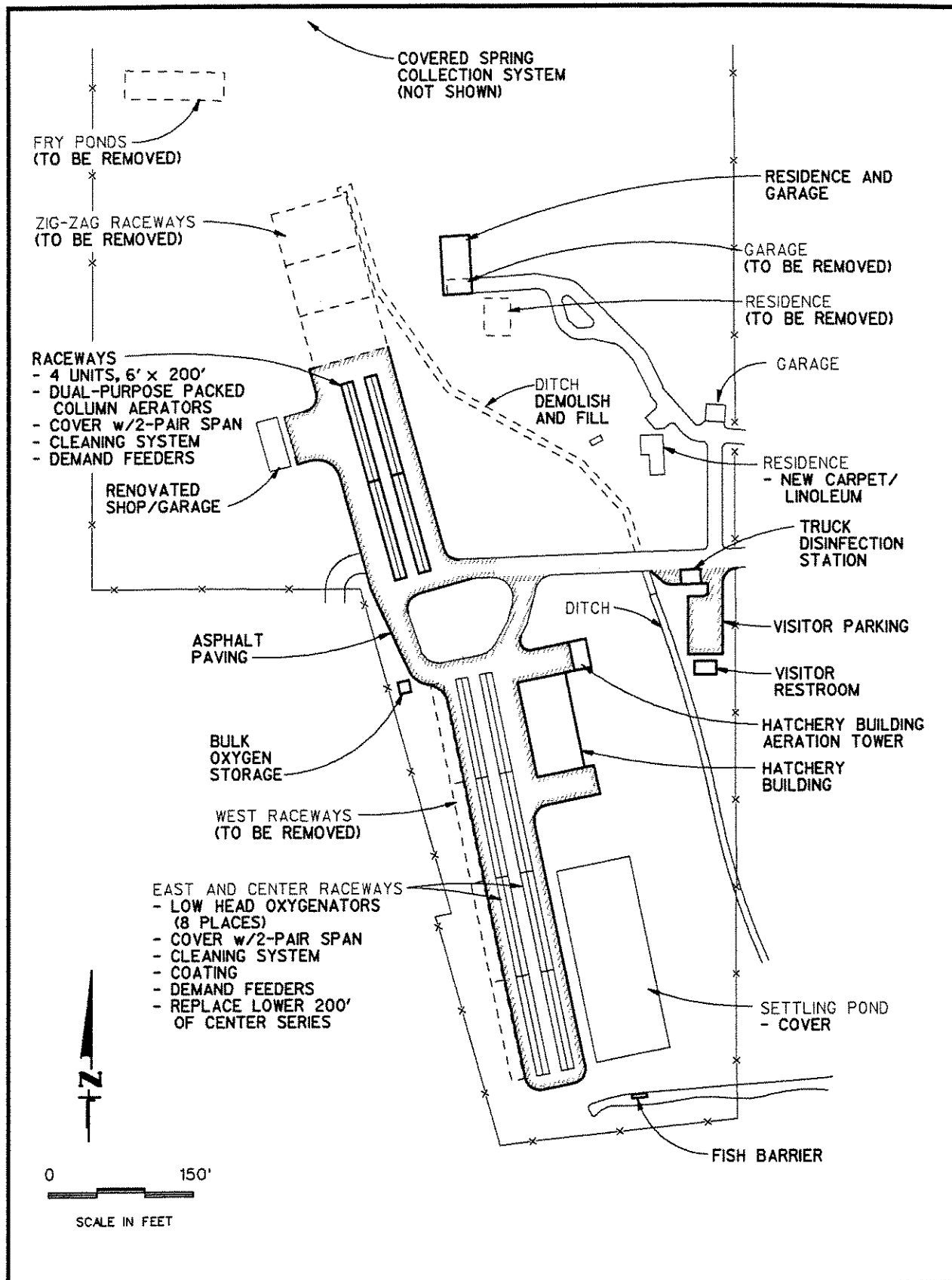


Figure 8-3. Whiterocks Hatchery Enhancement Plan

Production Units

Two pairs of new 6' x 200' raceways are proposed to be built above the existing raceways, replacing the existing west pair. In addition, the lower 200 ft of the center pair should be replaced in the same location. The remainder of the existing units should receive joint and surface repairs as needed followed by a flexible coating.

All of the raceways would be covered to provide protection from predation and sunburn. Four demand feeders would be installed per each 100 ft section of raceway, with automatic conveyors from supply bins at the head of the series.

Hatchery Building and Support Facilities

A new hatchery/office/lab building would replace the existing hatchery building (Figure 8-4). As noted previously, the new building would be located lower on the site to take better advantage of gravity flow. The existing office/garage would receive minor renovations.

Site Work

General site improvements include a potable water system, and a septic system for the new hatchery building. An open ditch currently serving as the hatchery supply overflow route will be demolished and filled. Upgrades to the site electrical, yard lighting, and communications systems, would be performed as required to meet the needs of new construction. Additional work would be performed to remove obsolete structures and pave work areas.

Visitor Accommodations

New visitor parking, restrooms, a kiosk, and informational signs would be provided at the entrance to the station, to reduce risk of contamination on the site. The preformed area has a small spring on it, and it will be necessary to install a curtain drain to divert the water into an existing ditch running off the site.

Residences

The oldest residence would be replaced, and the newer one updated with new floor coverings.

UFS059.DGN

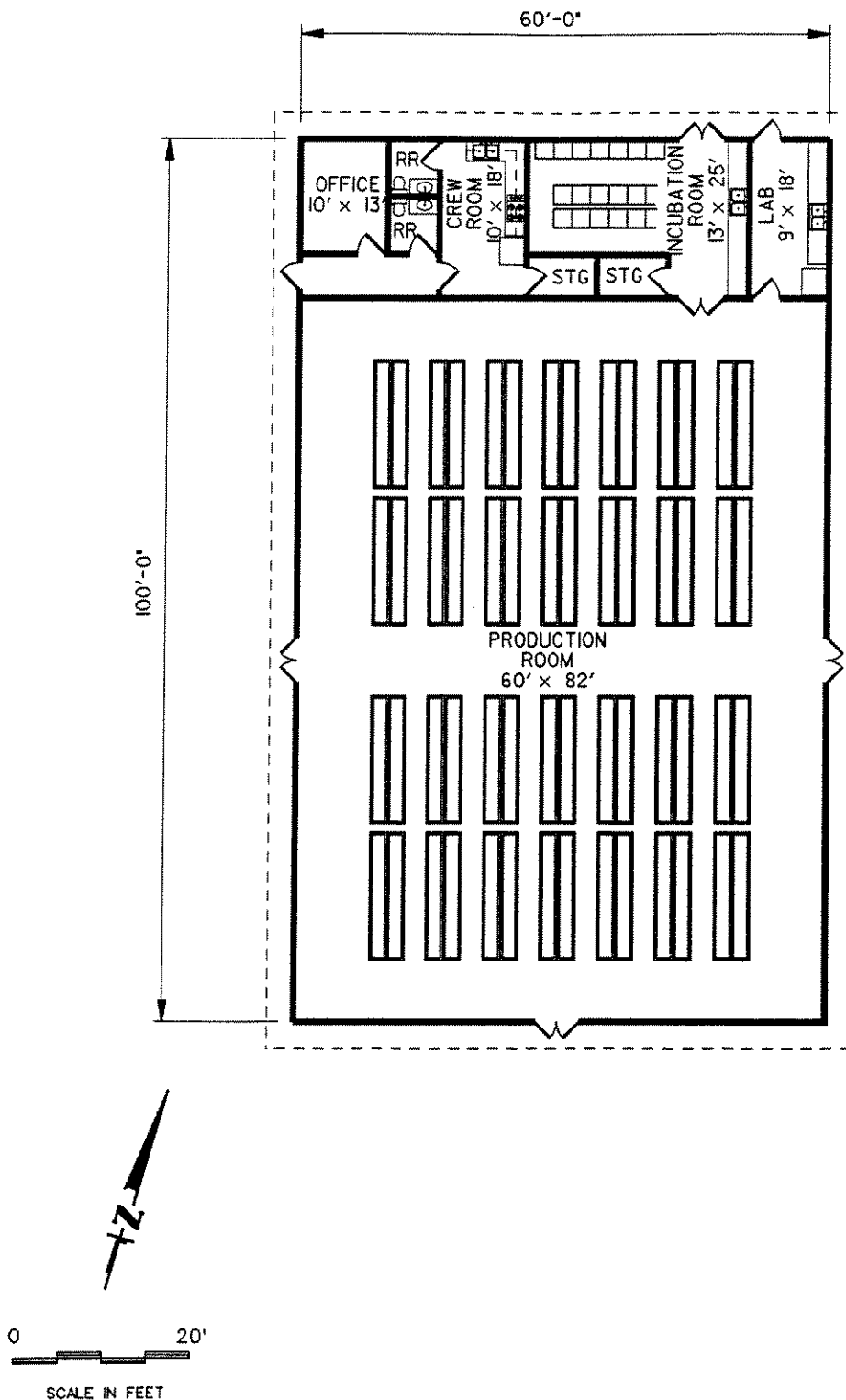


Figure 8-4. Whiterocks Hatchery Building

Additional Study Requirements

A geotechnical study of the springs will be necessary prior to development of the water collection system design, allowing the designer to verify the most appropriate system configuration. In addition, a geotechnical engineer should be consulted for soil conditions relative to foundation design and curtain drain requirements prior to design and construction of any new structures.

8.4 Estimated Costs

Construction costs for the proposed facility enhancements at Whiterocks Hatchery are estimated to be \$3.6 million, not including a 25% contingency typical at this conceptual level. Additional project costs are expected to occur in the form of studies and design services, project management, plus equipment and other costs. Total estimated project costs for Whiterocks Hatchery are \$5.1 million (Table 8-8).

During 1993 to 1995, the average annual operating budget at Whiterocks was \$141,000. Summarized expenditures indicate that 78% of this budget went to wages and benefits and 8% is attributable to feed. The proposed enhancement plan for Whiterocks Hatchery will increase production from 36,000 pounds to more than 131,000 pounds annually. Estimated operating costs for the expanded plan are \$228,000 per year (Table 8-9).

Table 8-8. Estimated project costs for the Whiterocks Hatchery enhancement plan.

Item	Quantity	Unit Cost	Amount	Total
Water Supply System				
Cover Spring Collector System				
Remove Existing Piping	1,510 LF	30	\$45,000	
Main Collector Piping	1,825 LF	85	155,000	
Branch Collector Piping	1,450 LF	62	90,000	
Site Prep and Dewatering	1 LS	76,000	<u>76,000</u>	
	Subtotal		366,000	
Process Water Piping				
Raceway Piping	1 LS	30,000	30,000	
Hatchery Building Piping	1 LS	36,000	<u>36,000</u>	
	Subtotal		66,000	
	Total			\$432,000
Disease Prevention Measures				
Truck Disinfection Station	1 LS	26,000	26,000	
Arched Raceway Covers				
60'x205' Structure	12,300 SF	14	172,000	
60'x410' Structure	24,600 SF	14	344,000	
Settling Pond Cover	15,000 SF	3	45,000	
Fish Barrier	1 EA	5,000	5,000	
	Total			\$592,000
Water Treatment				
Hatchery Building Aeration Tower				
Exterior aerator/headtank, 4500 gpm	1 LS	120,000	120,000	
Raceway Oxygenation System				
Storage Tank	1 EA	30,000	30,000	
Foundation	1 EA	15,000	15,000	
Enclosure	1 LS	6,000	6,000	
Main Piping	675 LF	32	22,000	
Branch Piping	130 LF	20	3,000	
Dual Control Station	6 EA	2,000	12,000	
LHO Units	8 EA	2,000	16,000	
Dual Purpose Packed Column Aerators	4 EA	6,000	<u>24,000</u>	
	Subtotal		128,000	
Monitoring and Alarm System				
D.O. Probe	20 EA	1,000	20,000	
Probe Electronics	20 EA	800	16,000	
Conduit and Wire	600 LF	20	12,000	
Monitor, Alarm and Control System	1 EA	10,000	<u>10,000</u>	
	Subtotal		58,000	
	Total			\$306,000
Waste Treatment				
Raceway Cleaning System - Waste Drainline	825 LF	50	41,000	
	Total			\$41,000

Table 8-8. Continued

Item	Quantity	Unit Cost	Amount	Total
Production Units				
Existing Raceway Coating				
Joint Repairs	800 LF	25	20,000	
Surface Repairs	2,600 SF	20	52,000	
Flexible Coating	22,000 SF	5	<u>110,000</u>	
Subtotal			182,000	
Existing Raceway Replacement (200')	1 EA	160,000	160,000	
New Raceways				
Strip, Clear, Grub	1 AC	5,000	4,000	
Cut/Fill	2,600 CY	8	21,000	
Finish Grading	3,400 SY	0.50	2,000	
Raceway Pair (200')	2 EA	160,000	<u>320,000</u>	
Subtotal			347,000	
Total				\$689,000
Hatchery Building and Support Facilities				
Hatchery / Office / Lab Building				
Cut/Fill	2,400 CY	8	19,000	
Administrative Area	593 SF	90	53,000	
Production Area	5,245 SF	150	787,000	
Lab Area	162 SF	130	<u>21,000</u>	
Subtotal			880,000	
Renovate Existing Office / Garage	1,200 SF	20	24,000	
Automated Feed System with Feeders				
Tank and 200' Feed Loop	2 EA	15,000	30,000	
Tank and 400' Feed Loop	2 EA	20,000	40,000	
Demand Feeders	96 EA	200	<u>19,000</u>	
Subtotal			89,000	
Total				\$993,000
Site Work				
Site Utilities				
Potable Water System	1 LS	15,000	15,000	
Hatchery Building Septic System	1 LS	20,000	20,000	
Site Electrical				
Primary	1 LS	30,000	30,000	
Secondary	1 LS	50,000	50,000	
Yard Lighting	1 LS	10,000	10,000	
Communications	1 LS	10,000	<u>10,000</u>	
Subtotal			135,000	

Table 8-8. Continued

Item	Quantity	Unit Cost	Amount	Total
Roads and Parking				
Strip, Clear, Grub	1.5 AC	5,000	8,000	
Base Course	810 CY	30	24,000	
Finish Grading and Paving	5,000 SY	16	<u>80,000</u>	
Subtotal			112,000	
Demolition/Removal				
Fry Ponds				
Demolition	100 CY	8	1,000	
Haul and Dispose	150 CY	25	4,000	
Fill	225 CY	8	<u>2,000</u>	
Subtotal			7,000	
Zig Zag Ponds				
Demolition	725 CY	8	6,000	
Haul and Dispose	1,090 CY	25	27,000	
Fill	1,604 CY	8	<u>13,000</u>	
Subtotal			46,000	
Raceway Pair (600')				
Demolition	435 CY	8	3,000	
Haul and Dispose	654 CY	25	<u>16,000</u>	
Subtotal			19,000	
Existing Hatchery Building				
Demolition	625 CY	7	4,000	
Haul and Dispose	300 CY	25	<u>8,000</u>	
Subtotal			12,000	
Residence and Garage				
Demolition	500 CY	7	4,000	
Haul and Dispose	250 CY	25	<u>6,000</u>	
Subtotal			10,000	
Total				\$341,000
Visitor Accomodations				
Visitor Parking				
Clear, Strip, Grub	1 LS	500	1,000	
Base Course	120 CY	30	4,000	
Finish Grading and Paving	550 SY	16	9,000	
Curtain Drain System	100 LF	20	<u>2,000</u>	
Subtotal			16,000	
Visitor Information Center				
Kiosk Structure	1 EA	6,000	6,000	
Signage	1 LS	2,000	<u>2,000</u>	
Subtotal			8,000	
Visitor Restrooms	1 LS	35,000	35,000	
Total				\$59,000

Table 8-8. Continued

Item	Quantity	Unit Cost	Amount	Total
Residences				
New Residence				
Structure (2,000 SF)	1 EA	120,000	120,000	
Landscaping	1 LS	1,000	<u>1,000</u>	
	Subtotal		121,000	
Existing Residence				
Carpet/Linoleum	1 LS	5,000	5,000	
	Total			\$126,000
Studies and Design Services				
Geotechnical study of spring protection	1 LS	10,000	10,000	
Geotechnical study of new construction sites	1 LS	5,000	5,000	
Permitting for NEPA compliance	1 LS	8,000	8,000	
Engineering Design - Preliminary and Final	1 LS	358,000	358,000	
	Total			\$381,000
Construction Summary and Total Project Capital Request				
Property Acquisition (trade for twenty acres of leased tribal land)			\$3,000	
Studies and Design Services			381,000	
Construction				
Water Supply System			432,000	
Disease Prevention Measures			592,000	
Water Treatment			306,000	
Waste Treatment			41,000	
Production Units			689,000	
Hatchery Building and Support Facilities			993,000	
Site Work			341,000	
Visitor Accommodations			59,000	
Residences			<u>126,000</u>	
	Construction Total		3,579,000	
Construction Contingency (25%)			895,000	
Project Management (5%)			179,000	
Equipment and Other Costs (3%)			107,000	
	Grand Total			\$5,144,000

Table 8-9. Estimated operating costs for the Whiterocks Hatchery enhancement plan.

	Existing Program	Enhancement Plan	Enhanced as Percent of Existing
Pounds Produced	35,511	131,391	370%
Staffing (FTE)	3	4	
Operating Costs			
Wages and Benefits	\$110,214	\$143,000	
Feed	11,322	42,000	
Fish Delivery	8,270	14,000	
Utilities	3,926	9,000	
Other	5,224	9,000	
Facility Maintenance	2,138	11,000	
Total	\$141,094	\$228,000	162%
Cost per Pound Produced	\$3.97	\$1.74	44%